

**INDIANA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS MANAGEMENT
DETERMINATION OF CALCIUM CARBONATE CONTENT IN SOILS
USING SEQUENTIAL LOSS ON IGNITION TEST
ITM No. 507-10T**

1.0 SCOPE.

- 1.1** This test method covers the procedure to determine the percentage of calcium carbonate (CaCO_3) in soils using sequential Loss on Ignition (LOI) test.
- 1.2** The values stated in either English or acceptable SI metric units are to be regarded separately as standard, as appropriate for a specification with which this ITM is used. Within the text, SI metric units are shown in parenthesis. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other, without combining values in any way.
- 1.3** This ITM may involve hazardous materials, operations and equipment and may not address all of the safety problems associated with the use of the test method. The user of ITM is responsible for establishing appropriate safety and health practice and determining the applicability of regulatory limitations prior to use.

2.0 REFERENCES.

2.1 AASHTO Standards.

T 87 Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
T 267 Determination of Organic Content in Soils by Loss on Ignition

3.0 TERMINOLOGY. Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101, and the AASHTO and ASTM Standards

4.0 SIGNIFICANCE AND USE. This ITM shall be used to determine the percentage of CaCO_3 in soils.

5.0 APPARATUS.

- 5.1** Oven, capable of maintaining temperatures of $230 \pm 9^\circ\text{F}$ ($110 \pm 5^\circ\text{C}$). Gravity, instead of blower convection, may be necessary when drying lightweight material.
- 5.2** Balance, Class G 1, in accordance with AASHTO M 231

- 5.3 Muffle furnace, capable of maintaining a continuous temperature of 1472 ± 18 °F (800 ± 10 °C) and having a combustion chamber capable of accommodating the designated container and sample
- 5.4 Sieve, No. 10 (2.0mm)
- 5.5 Crucibles or evaporating dishes, high silica, alundrum, porcelain, or nickel of 30-50ml capacity or Coors porcelain evaporating dishes approximately 100 ml top diameter
- 5.6 Desiccator, sufficient size containing an effective desiccant
- 5.7 Containers, suitable rustproof metal, porcelain, glass, or plastic-coated
- 5.8 Miscellaneous supplies such as asbestos gloves, tongs, and spatulas

6.0 SAMPLE PREPARATION.

- 6.1 Obtain a representative sample with a weight (mass) of at least 100 g from the thoroughly mixed portion of the soil passing the No. 10 (2.0mm) sieve.
- 6.2 Place the sample in a container and dry in the oven at 230 ± 9 °F (110 ± 5 °C).
- 6.3 Weigh the sample and container after 15 minutes of drying. Continue drying the sample and reweigh at 5 minute intervals until constant weight (mass) is achieved (Note 1).

Note 1 – Constant weight (mass) is defined as the weight (mass) at which further drying does not alter the weight (mass) by more than 0.1 percent.

- 6.3 Remove the sample from the oven, place in the desiccator and allow to cool.

7.0 PROCEDURE.

- 7.1 Measure the weight (mass) of the crucible (W_1)
- 7.2 Place a dried soil sample of 10 to 15 grams inside the crucible
- 7.3 Measure the weight (mass) of the crucible and soil to the nearest 0.01g (W_2)
- 7.4 Place the crucible and soil into the muffle furnace at a temperature of 833 ± 18 °F (455 ± 10 °C) for 6 hours
- 7.5 Remove the crucible and soil from the furnace, place into a desiccator, and allow to cool

- 7.6** Remove the cooled sample from the desiccator and determine the weight (mass) of the crucible and soil to the nearest 0.01g (W_3)
- 7.7** Place the crucible and soil into the muffle furnace at 1472 ± 18 °F (800 ± 10 °C) for 6 additional hours
- 7.8** Remove the crucible and soil from the furnace, place into a desiccator, and allow to cool
- 7.9** Remove the cooled sample from the desiccator and determine the weight (mass) of the crucible and soil to the nearest 0.01g (W_4)

8.0 CALCULATIONS.

- 8.1** Calculate the percentage of calcium carbonate to the nearest 0.1 % as follows:

$$\% \text{CaCO}_3 = 2.27 \times \frac{W_3 - W_4}{W_2 - W_1} \times 100$$

Where:

W_1 = Weight (mass) of crucible

W_2 = Weight (mass) of crucible and dried soil

W_3 = Weight (mass) of crucible and soil after ignition at 833 ± 18 °F (455 ± 10 °C)

W_4 = Weight (mass) of crucible and soil after ignition at 1472 ± 18 °F (800 ± 10 °C)

- 9.0 REPORT.** The percentage of calcium carbonate is reported to the nearest 0.1 percent.